

Translational Research and Medicine at NASA: From Earth to Space and Back Again

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The Space Environment provides many challenges to the human physiology and therefore to extended habitation and exploration. Translational research and medical strategies are meeting these challenges by combining Earth based medical solutions with innovative and developmental engineering approaches. Translational methodologies are currently applied to spaceflight related dysregulations in the areas of: (1) cardiovascular fluid shifts, intracranial hypertension and neuro-ocular impairment 2) immune insufficiency and suppression/viral re-expression, 3) bone loss and fragility (osteopenia/osteoporosis) and muscle wasting, and finally 4) radiation sensitivity and advanced ageing. Over 40 years of research into these areas have met with limited success due to lack of tools and basic understanding of central issues that cause physiologic maladaptation and disrupt homeostasis. I will discuss the effects of living in space (reduced gravity, increased radiation and varying atmospheric conditions [EVA]) during long-duration, exploration-class missions and how translational research has benefited not only space exploration but also Earth based medicine. Modern tools such as telemedicine advances in genomics, proteomics, and metabolomics (Omics-sciences) has helped address syndromes, at the systemic level by enlisting a global approach to assessing spaceflight physiology and to develop countermeasures thereby permitting our experience in space to be translated to the Earth's medical community.

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